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(CRS)

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*Study of the Effect of the Community-Based Food and Nutrition Program on the
Nutritional Status of Children 18 to 36 Months of Age in the Ouémé and Plateau
Departments: Anthropometric Survey*

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List of Abbreviations

AC	Animatrice Communautaire - Community Health Promoter
CDC	Center for Disease Control
C/PAN - FNP	Cellule du Programme Alimentaire et Nutritionnel - Food and Nutrition Program Unit
CPS	Centre de Promotion Sociale - Social Promotion Center
CS	Child Survival
CSSP	Child Survival Support Program attached to Johns Hopkins University
DAP	Detailed Activity Plan
DPP	Detailed Program Plan (Multi-year program plan), currently DAP
DPS	Direction de la Protection Sociale - Department of Social Protection
EDS	Enquête Démographique et de Santé - Socio-Economic Health Study
EPI	Expanded Programme on Immunization
FNP	Food and Nutrition Program (PAN in French)
FHA/FFP	Food and Humanitarian Assistance/Office of Food for Peace
IGA	Income Generating Activity (small or micro enterprise).
IMR	Infant Mortality Rate
KPC	Knowledge, Practice, (Vaccination) Coverage Survey developed by Johns Hopkins Univ.
MCH	Maternal Child Health Program
MIS	Management Information System
MSP	Ministère de la Santé Publique - Ministry of Public Health
NCHS	National Center for Health Statistics
NGO	Non-Governmental Organization
ORT	Oral Rehydration Therapy
PAN	Programme Alimentaire et Nutritionnel - Food and Nutrition Program, administered by the PAN unit, a joint unit of MSP and CRS/Benin
PBC	PAN a Base Communautaire - Community-Based PAN
PCIME	Prise en Charge Integree des Maladies de l'Enfance - Integrated Childhood Disease Management
WHO	World Health Organization

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EXECUTIVE SUMMARY

Since 1982, the Government of Benin in partnership with CRS/Benin has carried out an MCH Program whose principal objective has been the reduction of malnutrition rates for children aged 0 to 24 months of age. In the course of the 90s, this program has undergone a number of programmatic revisions designed to improve the implementation strategy of the program and show to donors the program's impact on its participants.

Despite encouraging results and continuous improvement in program activities, two principal constraints remain.

First, it was necessary to implement an advanced strategy to:

- ◆ Improve targeting of beneficiaries so that the most needy are participating, and
- ◆ Ensure the sustainability of program activities such that the beneficiaries themselves progressively took over program management.

Second, the donor community are unanimous in its need to have concrete results showing improved impact in order to justify the resources given to such programs worldwide. This will require not only the identification of measurable indicators but also the development of new tools that are inexpensive enough to permit NGOs to show suitable progress. It was primarily for these two reasons that:

- ◆ First, MPSF and CRS/Benin designed the community based PBC strategy to bring the program closer to the most underserved areas. In so doing, various responsibilities concerning the direction and management of the program will be entrusted to the local population,
- ◆ Second, the two counterparts have decided to conduct a KPC survey before the start of the community based PAN. This survey will establish a base-line concerning vaccination coverage and the knowledge and practices of mothers in the areas of MCH.

The community based FACS is currently being executed in the Ouémé, the Plateau, the Mono, the Couffo, the Borgou and the Alibori Departments. CRS/Benin in partnership with the MPSF receives financial and material support from Title II and Farm Bill grants for a period of five years, in order to progressively implement the FNP's new approach. Approximately 42,500 beneficiaries will receive a monthly food ration starting from October 1, 1996 lasting until September 30, 2000 in village communities in the 12 Beninese departments.

The collection of baseline data took place in the Ouémé and Plateau Departments in October 1997.

To evaluate the impact of the new strategy on the nutritional status of children, the MPSF and CRS/Benin conducted a final anthropometrical study of 78 targeted communities enrolled in the FACS program from 24 to 26 July 2000. This survey was conducted with the technical support of IRSP in Cotonou in collaboration with the Cellule/PAN and CRS/Benin. The survey goals were:



- ◆ To analyze the distribution of the anthropometry indices¹, height-age, weight-age, and weight-height, in children aged 18 to 36 months of age in a representative sample of the 78 rural and urban communities of the Ouémé and Plateau Departments where CRS intervenes, and
- ◆ To measure the impact of the program by comparing the prevalence of stunted growth, children who are underweight and wasting in 1997 to that of 2000.

The survey provided reliable information that allows the determination of the impact of the project on the nutritional status of children aged 18 to 36 months in the target zone. All the objectives set for this survey were achieved in seven weeks.

The principal survey results obtained after examination of the 629 questionnaires shows that, in the communities where CRS/Benin and the FNP Unit intervenes in the Ouémé and Plateau:

- ◆ 35.3% of the children aged 18 to 36 months of age surveyed suffer from chronic malnutrition, indicated by growth stunting and 9.4% of the same children illustrate severe stunting;
- ◆ 29.3% of children surveyed are underweight with 6.2%, or 39 of the 629 children being severely underweight;
- ◆ 5.8%, or 36 among the 629 children surveyed suffer from acute malnutrition illustrated by wasting;
- ◆ The mean z-score for stunting is -1.68 ± 1.02 and for underweight children, it is -1.50 ± 0.97 , whereas for wasting, the mean z-score is -0.64 ± 0.86 . The first two averages correspond to very high levels of malnutrition for both indices.
- ◆ A statistically significant reduction of 5.5% in the prevalence of stunting in children 18 to 36 months old, as compared to the 40.8% surveyed in 1997 in this age group;
- ◆ A significant reduction of 16.1% in the prevalence of stunting in children 24 to 30 months old, as compared to the 42.7% surveyed in 1997 in this age group;
- ◆ A tendency toward reduction in the prevalence of children who are underweight and who show wasting, but the differences observed between 1997 and 2000 for both these types of malnutrition are not statistically significant.
- ◆ Exposure to the program improves height-weight growth in children ages 24 to 36 months when involvement in the program exceeds 18 months.

¹ The measurements used in this survey are: height, weight and age. When these same measurements are combined, we obtain the different anthropometric indices, which are height for age, weight for age and weight for height. The indicators used in this study are: severe and moderate malnutrition, which we obtain through the analysis of indices in relation to the standard deviations.

1. INTRODUCTION

1.1 Background

Beginning in 1982, CRS/Benin decided, in consultation with its Beninese government counterpart, to use Title II resources to develop a nutritional and social development instead of outright social assistance for which the impact was difficult to estimate. The national program, known as the Food and Nutrition Program (PAN), is being executed in 95 MCH Centers spread throughout the Beninese territory. The large majority of these centers are government run. The rest are either Church run or managed by private Community Organizations: 68 centers with the MPSF, 9 centers for the Ministry of Rural Development, 15 centers for the Catholic Church and 3 centers for community organizations.

These centers are essentially located in the administrative seat of the sub-prefectures. Thus, the target group for the program, namely, the poorest populations, often have to travel long distances to take advantage of the services offered by the social centers.

Roughly 50,000 children aged 0 to 24 months, participate on a regular monthly basis in the program's activities of growth monitoring and follow up of the vaccination schedule. The program also conducts sessions on health information, child nutrition, vaccination, child diarrhea treatment, breastfeeding, etc. for the children's mothers before the growth monitoring sessions. To provide incentive for the mothers to come regularly, a Title II food ration accompanies the growth monitoring and education activities.

In addition, CRS/Benin has initiated over the years income generating activities for the mothers who wish to start a small commerce activity or micro enterprise.

Despite the positive results this program has on the health of children and mothers who participate in it, past evaluations in 1993 and 1995 have shown the following insufficiencies:

- ◆ National program coverage remains low (around 7 % of the target population of children ages 0 to 2).
- ◆ The manner in which persons are selected for the program does not necessarily guarantee that the true target population is being reached. Given the location of existing centers, it is not surprising to find that the many of the mothers come from urban and semi urban areas.
- ◆ Low community involvement in the implementation of activities contributed to decreased participation.
- ◆ Malnutrition rates for children between 0 and 2 years of age has not significantly decreased from an average of 35% despite the many years in which the program has existed.

- ◆ Many of the messages used to educate and sensitize the mothers following the growth monitoring and vaccination sessions are not put into practice in the households. Reasons for this are often linked to the low purchasing power of the mothers.
- ◆ The mothers who participate in the MCH program and who wish to implement the good habits which lead to good health for the family lack the support of other family members (husbands, mothers, aunts, grandmothers, and other family members). They are often opposed to changes made by the mother, who is the only member of the household educated at the MCH centers and who, as a result, is the only one who understands the advantages of these changes.

The community approach to management of the FNP's activities has been chosen as the new, preferred strategy. This approach, whose background includes the direction of MCH activities by the targeted communities themselves, by locally formed and organized teams, seeks to reinforce community capacity to solve their own health problems, not only when it concerns mother and child health, but also the whole range of developmental problems they face. With a well elaborated program of activities, education messages targeted to the needs of each community according to the strengths and weaknesses and in practices identified in the area of child and mother survival, and with adequate supervision, a significant impact can be expected.

For the new strategy to succeed, the notion of community was introduced in view of decentralizing the interventions to better reach the program's targets.

To date (FY 2000) a total of 214 communities are served by CRS (74 in the Ouémé and Plateau Departments, 84 in the Mono and Couffo Departments, and 56 in the Borgou and Alibori Departments).

For this new venture, it was critical to identify a number of measurable progress indicators at different periods during the projected life of activity. The standard anthropometry survey carried out in the departments is based on three principle indices:

- ◆ Height for age,
- ◆ Weight for age,
- ◆ Weight for height.

The anthropometric surveys adhering to the scope of the impact evaluation shall be fulfilled after three months of implementation of CRS/MPSF interventions in each department. They will also be completed by a KPC survey that will be undertaken at the same time.

To manage anthropometric component of the impact evaluation survey in the Ouémé and Plateau Departments, a team of trainers consisting of Dr. Victoire Agueh, Dr. Edgard-Marius Ouendo, and Mr. Noel Paraiso trained surveyors and supervisors in regard to:

- ◆ The objectives of the survey, its organization and the contents of the questionnaire,

- ◆ Techniques for measuring weight and height with accuracy and precision,
- ◆ Recommended precautions for minimizing errors in reading and recording measurements.

1.2 CURRENT STATUS OF PBC IN THE OUÉMÉ AND PLATEAU DEPARTMENTS

Three years after its inception in the Ouémé and Plateau departments, the PBC planned initially to cover 81 communities. Currently, however, the project functions in only 73. In the five communities of Modogan and in that of Malawi the program's activities were suspended after two years and one year of intervention, respectively.

In sum, roughly 10,000 children from the ages of 0 to 24 months have participated each year in the program since 1997 in the two departments.

In each of the communities served, the activities are conducted by ACs (or community agents) assisted by village social development committees (CVDS). Each community utilizes 3 ACs including one principal one and two secondary ones. The main activities of the ACs are: Health and Nutrition education for mothers, growth monitoring in children 0 to 2 years old, the recovery of minor to moderate cases of malnutrition and the referral of severe cases, home visits for children with hidden malnutrition and the distribution of food to mothers. The sessions on nutrition education are conducted each month with a rate of participation of 25 mothers per session. The number of sessions conducted each month by the AC varies according to the participation rate of mothers of children ages 0 to 24 months.

With the goal of creating and maintaining ACs' motivation, they are given a bicycle for use in home visits and the sum of 500 francs for each session they lead.

Mothers are motivated to attend education and child weighing sessions through the distribution of food, including enriched weaning flour, soybean oil and corn semolina.

For each education and growth monitoring session, mothers pay 200 F CFA, 20% of which is used for community development activities, 20% for the operation of MCH centers, and the remaining 60% going back to FNP unit.

In 1997, CRS/Benin introduced a *Credit and Savings Pilot Project* (PPCE). Of the 73 functional communities in the Ouémé and Plateau Departments, 10 benefit from the PPCE, which awards loans to mothers of children participating in the program and provides them with training in financial management in order to help them in creating income generating activities.

The performance evaluation of the PBC carried out in April 2000 highlighted the following data in the Ouémé and Plateau Departments:

- ◆ 73% and 74% of children registered in the program were weighed in 1998 and 1999, respectively;
- ◆ 73% and 70% of children ages 11 to 23 months registered in the program were vaccinated in 1998 and 1999, respectively;
- ◆ In June 1999, 89% of the communities in Ouémé and Plateau Departments reached Level 1 community participation; 32% reached Level 2 and 13% Level 3;
- ◆ The activities planned for the program at the departmental and central levels function according to the established plan. At the community level, the counting of children and monthly education and weighing sessions occur regularly. As opposed to home visits, the monthly CVDS meetings and quarterly general assemblies in the communities are not done regularly;
- ◆ Problems exist relating to the PAN unit agents' motivation (PAN being the management arm

of the PBC which serves as intermediary between the Beninese government and CRS/Benin), directors of MCH centers, community agents and other CVDS members, all of which weakened the program's effectiveness.

On the whole, the community based PAN functions adequately in the Ouémé and Plateau Departments and attains its objectives. The transfer of competence toward communities has become more and more a reality.

1.3 Survey Objectives

The objectives of the survey were to:

- ◆ Determine the distribution of the indices "height for age", "weight for age", and "weight for height" in children 18-36 months old in a representative sample of the 78 communities of the Ouémé and Plateau Departments where community based are carried out;
- ◆ Obtain data to assist in measuring the impact of the FACS on the nutritional status of children aged 18-36 months.

At the end of the survey, the Ministry of Family and Social Protection, Catholic Relief Services and the Ministry of Public Health will have for the year 2000 the following information on the status of malnutrition in the Ouémé and Plateau Departments:

- ◆ the percentage of children showing moderate or severe stunting,
- ◆ the percentage of children who are moderately or severely underweight,
- ◆ the percentage of children suffering from moderate or severe wasting,
- ◆ the comparison of percentages with those of the 1997 survey,
- ◆ comments on the eventual effect of CRS interventions, and
- ◆ recommendations for improving the interventions.

2. STUDY AREA

The study took place in the Ouémé and Plateau Departments, which used to make up the former Ouémé Department, where the baseline survey was conducted in 1997. These two departments are situated in southeastern Benin.

The current Ouémé Department is bordered to the north by the Zou Department, to the south by the Atlantic Ocean, to the east by the Republic of Nigeria and sub-prefectures of Ifangni, Sakete and Adja-Ouere, and to the west by the Atlantic Department.

As for the Plateau Department, it is bordered to the south by the sub-prefectures of Dangbo, Akpro-Misserete, Avrankou and Adjarra, to the north by the Zou Department, to the east by the Republic of Nigeria, to the west by the Zou Department and sub-prefectures of Bonou and Adjohoun. The whole of the two departments covers a surface area of 4,545 square kilometers.

The Ouémé Department comprises the following 9 sub-prefectures/urban districts: Adjarra, Adjohoun, Aguegues, Akpro-Misserete, Avrankou, Bonou, Dangbo, Porto-Novo and

Seme-Kpodji. Its seat is the Urban District of Porto-Novo.

The Plateau Department comprises 5 sub-prefectures: Adja-Ouere, Ifangni, Ketou, Pobe and Sakete. Its seat is Pobe.

The INSAE estimates the Ouémé Department's 2000 population to be 733,883. As for the Plateau, its population is 396,902 inhabitants.

The principal economic activities of the population of the two departments include: agriculture, fishing and commerce. Commerce is conducted between rural and urban zones and between neighboring departments and Nigeria.

The climate is humid and tropical with two rainy seasons (April to June and September to October) and two dry seasons (July to August and November to March). The relatively high temperature varies rarely between 24 C and 32 C. Average precipitation is roughly 1.200 mm of rain per year.

3 . METHODOLOGY

3.1. Type of Study

The anthropometric survey is essentially a descriptive, quantitative study. This survey has also an analytic (comparative) focus. It aims to measure the impact of CRS interventions on the nutritional status of children after three years (1997-2000) in the Ouémé and Plateau Departments. Data were collected through simple observation. The study focused on children 18 to 36 months in age in the Ouémé and Plateau Departments who were weighed and measured for height. Their age was determined from date of birth if records were available or by estimation.

An analog study of the basic nutritional situation was lead in the former departments of the Ouémé in 1997 on children in the same age group (18 to 36 months) and provided data in the areas of growth stunting, children who are underweight and wasting. Those data will be compared with the ones found in this study.

3.2. Sampling Frame

3.2.1. Estimation of the Parameters of the Population from the Sample

In order to obtain complete information about the different measurements--weight and height--of children aged 18 to 36 months which is the target population for the survey, the ideal strategy would be to visit each household with a child in the target age group in each of the 78 FACS project communities of the Ouémé and Plateau Departments. We would have obtained the parameters for the distribution of weight and height (average, mean, and standard deviation or z-score) in the whole project area. But to visit each household would be long and onerous. It is because of this that we are selecting a sample to describe the entire group.

From this sample we have estimated the parameters (average, mean, and standard deviation) for the sample size which interest us and described the level of confidence of our estimates for the whole population. To do this, we performed random selections at each level -- community, village, household, etc.

3.2.2. Household and Child Selection

Children aged 18 to 36 months constitute the primary sampling unit of the survey. The best technique for selecting such children would be to perform a simple random selection which would consist of making a list of all the children in all 78 project communities in the Ouémé-Plateau FACS aged 18 to 36 months, assigning a number to each child, and putting all the numbers in a receptacle and randomly drawing numbers until the desired number of children we wish to survey is reached.

In African regions, and in particular, Benin, it is not possible to obtain a list of all the children of the target age in the FACS project communities. We have therefore chosen a stratified sampling method using a cluster selection with multiple steps. Each cluster represents a community. In the FACS program, a community can be considered a hamlet, a village, or a grouping of villages.

3.2.2.1. First Step

During this stage, the communities that make up the sample were chosen using a systematic method with a tri-proportional probability according to population size. Thus, 30 clusters (communities) were chosen from the 78 Ouémé-Plateau FACS communities and the data were collected within these clusters. These 30 clusters are the same as those chosen for the KPC survey. These clusters constitute the primary sampling units.

3.2.2.2. Second Step

This step allowed the survey team to select the households to survey. At the level of each community, the survey team, under the direction of the supervisor, would meet with the village chief or mayor and some of the members of the village social development committee (CVDS). These people give information on the number of localities (villages, hamlets or neighborhoods) which constitute the community. One of the localities is then randomly drawn. The supervisor then proceeds to the center of the first randomly selected locality and randomly selects a direction. S/he numbers all houses situated in this direction and then randomly selects one of the various houses (based on the numbers given to the houses.) The survey begins with this house and continues on the basis of the house whose door has the closest proximity to the first house, until the number of children required per cluster (20 children) is reached.

3.3. Sample Size

It is important to have a sample size that allows us to obtain a good estimation of the various statistical parameters (mean, median, standard deviations for weight and age) which interest us and to determine the margin of error with respect to the real values of the parameters within the study population. It is equally important to have a representative sample. The random selection with the cluster method guarantees representativeness. The precision is tied to the size of the sample: the larger the sample, the higher the precision.

By using a parameter estimation and by choosing a level of desired precision, we can calculate the minimum necessary sample size. For a survey such as ours, the appraisal of the impact of CRS interventions will be made on the basis of calculation of the prevalence rate of malnutrition in the communities. Consequently, the minimum sample size is given by the formula for the calculation for prevalence or rates:

$$n = \frac{z^2 c(pq)}{d^2}$$

where **n** represents the minimum sample size;

z is determined by the desired statistical certainty;

c is the cluster effect, which often has a value between 1.5 and 2.0;

p is the prevalence or coverage rate/level of the phenomenon to be investigated (parameter) but most often, **p** is determined when the product of **pxq** has the largest possible value to obtain a sample size larger for the given values of **z** and **d**. For this reason, **p** is often equal to 0.5, **q** = 1 - **p**; and **d** = precision desired.

The value of **d** is determined by the margin of error desired or by the precision we look for. For example if **d** = 0.05 (i.e., if we allow ourselves a 5% error), the statistical certainty chosen would be 95%. Most often, in a study such as ours, the chosen statistical certainty is 95% and the corresponding value of **z** is 1.96 (taken from a statistical table that corresponds to a population with a normal distribution). Taking for the factor of cluster **c** the value of 1.5 and in consideration the values for **z**, **p**, **q** and **d** defined above, the sample size (**n**) will be:

$$n = \frac{(1.96 \times 1.96)(1.5)(0.5 \times 0.5)}{(0.05 \times 0.05)} = \frac{(3.84)(1.5)(0.25)}{(0.0025)} = 576$$

The number of clusters is not fixed, but there are a number of theoretical reasons that suggest using at least 30 clusters and to equally distribute the final sample among the 30 clusters (Henderson, et. al., 1982).

By dividing the number 576 for the sample size by 30 (number of clusters retained), we obtain the number 19.2 children per cluster which has been rounded up to 20 children for fear of losing precision. This gives us final sample of **n**=600 children . These 600 children are equally divided up among the 30 clusters with 20 children aged 18 to 36 months each.

This sample size allows us to have more precision and to make comparisons among sub-groups (boys, girls, age groups, etc.), with a precision of at least 5% margin of error.

The same step was observed in 1997 at the time of the survey, which allowed for the

establishment of basic data prior to the start of the program.

3.4. Data Collection Tools

Three types of data collection tools were used:

- ◆ A survey questionnaire,
- ◆ A Shorr height measuring board, and
- ◆ A hanging spring-dial scale (Salter type).

3.4.1. The Questionnaire

The questionnaire contains 12 questions to assure the proper collection of information regarding the child's age, his/her standing height or recumbent length, and his/her weight (see Appendix A). The first two questions are addressed to the mother or child's caretaker. They collect information such as the name of the child and mother in order allow the survey team to quickly recover the mother in question should the supervisor discover that additional information is needed or that the survey is incomplete.

The third question collects information about the child's sex since the reference population was established according to gender.

Question 4 asks about the length of participation in the program of the child surveyed. This variable will allow a more precise appraisal of the changes induced by CRS interventions, for the longer the participation in the program, the better the child's are for following the nutritional plan.

Questions 5, 6 and 7 collect information about the child's exact age or estimated age the day the measurements are taken in order to determine the stature or position for taking the height measurement. When a child is less than 24 months of age, his height is measured in a recumbent position; whereas when a child is 24 months or older, his height is taking in a standing position.

Question 8 allows us to collect information about the manner in which the child's birth date was verified.

Questions 9 and 10 allow spaces for the recording of recumbent length or standing height and weight.

Questions 11 and 12 require information about the quality of the measures taken and difficulties encountered by the surveyors and supervisors.

The comment section provides space for surveyors and supervisors to write down additional observations made during the data collection.



3.4.2. Shorr Measuring Boards and Scale

Each team (two surveyors and one supervisor) was equipped with one Shorr measuring board and one hanging spring dial scale (SALTER model) in order to measure standing height or recumbent length and weight.

3.5. Training of Supervisors and Surveyors

3.5.1. Principal Objective

The principal objective of the training was to train the participants to take anthropometric measurements with precision and accuracy in children 18 to 36 months of age.

3.5.2. Training Objectives

At the end of the training the participants must be able to:

- ◆ Explain the importance of the following anthropometric infant indices: height/age, weight/age, and weight/height,
- ◆ Describe the instruments used to measure (scale and height measuring board),
- ◆ Measure with precision the weight and height in infants 18 to 36 months of age,
- ◆ Explain the importance of taking anthropometric measurements with precision,
- ◆ Explain the different types of errors related to the taking of anthropometric measurements,
- ◆ Take measures to minimize the errors and bias that may arise, and
- ◆ Detect errors and identify their sources.

3.5.3. Before the Training

A survey team composed of professionals from IRSP, CRS/Benin and the FNP Unit, based on information contained in the documents that were elaborated in 1997 for the anthropometry survey of the Ouémé Department, developed the training objectives, pedagogical methods, and the schedule of activities.

The training document used was the same as that written by Mr. Irwin Shorr and translated into French from English in 1997 for the Ouémé Anthropometry Survey. The survey questionnaire and the supervision checklist were also the same as those developed in 1997 for the training document. However, given the fact that this survey is an impact evaluation, a

complementary question was added to the survey questionnaire. The question asks about the child's length of participation in the program. The sheet used for determining the measuring position for the child and the age estimation sheet were completed by the IRSP team.

3.5.4. During the Training

The training took place from Monday the 17th to Friday the 21st of July 2000 at the Centre Chretien d'Accueil et de Formation (CCAF) in Porto-Novo. 20 surveyors and 10 supervisors from CRS, IRSP, and CPSs from the Ouémé and Plateau Departments. were trained. The IRSP team supervised the training session.

The training was concerned principally with two types of measures--weight and height. Particular attention was given to the following elements:

- ◆ Basic understanding of anthropometric indices and indicators
- ◆ The use of measuring instruments,
- ◆ Correct measurement reading,
- ◆ Correct recording of measurements,
- ◆ Different measurement positions for height according to age,
- ◆ Filling out the questionnaire, and
- ◆ Age estimation techniques in the absence of written documents.

Beginning on the second day of training, practical exercises were organized in the villages of Dowa Dedome (commune of the Ouando/Urban district of Porto-Novo) and Aglogbe (commune of the Aglogbe/Sub-prefecture of Adjara) which allowed the surveyors and the supervisors to practice measuring weight and height with precision and accuracy on children according to what was taught. These practical exercises allowed the participants to practice operating the measuring instruments and reading and recording measurements.

During the afternoons, special training sessions were given to supervisors on the characteristics of anthropometry surveys and on the role they should play in the survey teams. These responsibilities can be summarized as follows:

- ◆ Selection of the first home,
- ◆ Supervision of the surveyors during age determination and during the taking, reading and recording of measurements in order to ensure quality and precision,
- ◆ Validation of the questionnaire, and
- ◆ Resolution of problems as they appear.

During the fourth day of the training, a standardization test was organized in the primary school classrooms of the Public School in the village of Gouako Cotoclome (commune of the Ouando/Urban district of Porto-Novo). This test enabled the trainers to assess the participants' skills with regard to precision and accuracy in measuring height and weight. "Precision" is the ability to repeat the same measurement on the same subject independently with little variation. "Accuracy" is the ability to obtain measurements that are closest to the real measurement.

Analysis of the results showed that most participants had inferior height measurements to those of the principal trainer. The main cause was found to be not positioning the child's knees correctly while measuring in the standing position. The degree of accuracy in weight measurements was, on the whole, very good. The standardization test also allowed us to point out specific reading and recording errors.

Group discussion sessions were organized following the standardization test (last day of training) so that the participants could improve their measuring techniques and thus guarantee good data collection during the survey. After these group discussions a retraining session was organized.

For the standardization test, the participants were separated into 3 groups of 10 members each working with 10 children per group. Each participant measured each child twice for standing height, the hardest measurement to take, and weight. Measures were taken independently so that participants could not recall their first height measurement before doing the second. Both weight and height measurements were done independently of each other.

Accuracy in the analysis of the results requires that the measurements obtained be compared to the real measurements, which are those done on each child by Dr. Victoire Agueh. Each participant's first and second measurements are then compared in relation to each other and to Agueh's. The results of the standardization test can be found in appendix D of this report.

3.6. Collection of Data

Data collection began at the end of the training. It took place over three consecutive days from Monday the 24th to Wednesday the 25th of July, 2000, in thirty clusters that took part in the KPC survey in the Ouémé and Plateau Departments. Twenty surveyors and ten supervisors were separated into ten teams of three people each consisting of two surveyors and one supervisor. The survey team coordinated the data collection.

When a survey team arrives in a household and after greeting the members, the team explains the survey goals to the head of the household and/or women before identifying any children between the ages of 18 and 36 months who will be weighed and measured. If these children exist in the household, the team then asks to see birth or other documents recording a precise date of birth. If she answers "no", the team uses the age estimation sheet attached in the appendix. The age and identification sections of the questionnaire are filled out before continuing on to the actual measurements of the child. The team proceeds in this manner until at least 20 children have been measured in each cluster.

If, for one reason or another, correct measurements were not taken or when a child presents other problems which may affect the precision of height (or length) measured, an extra child 18-36 months was measured to replace the previous. This explains a number in excess of 20 children measured in certain clusters.

Each supervisor stayed with his team until the end of the survey. All of the completed

questionnaires were verified at the survey site before leaving.

3.7. Data Entry

After the survey, an IRSP team checked the number and contents of questionnaires by cluster. In each cluster, the questionnaires were numbered 1 to 20 or more, according to the number of children surveyed.

The data entry was done twice by two data entry specialists working independently and simultaneously on two different computers using EPI-INFO, one beginning with the 30th cluster, the other with the 1st. Data entry took place under IRSP supervision. Comparison of the two data entry documents was done using EPI-INFO VALIDATE and allowed the IRSP team to correct errors that turned up.

3.8. Special Information Used during the Survey

In certain cases, it is very difficult to determine exact ages for many individuals and especially for children who do not have birth certificates or other documents. This is particularly true in rural areas of Benin where birth registration is not common and where the exact birth date is rarely written in official documents.

To reduce age-related misreporting, we developed a table to indicate the limits for children aged 18 to 36 months (see a copy of the table in the appendix). Another table was also developed to help identify the proper measuring position according to birth date. In this table two age groups were identified: children 18 to 24 months of age and children 24 to 36 months of age. When a child's estimated age is close to two years, surveyors were trained to probe for information, such as local events, that would allow them to properly situate the child's real age (see in the appendix a copy of the table used to determine the correct measuring position).

3.9. Method of Analysis and Discussion of the Results in Groups.

The data were analyzed on the software Epi Info. The tabulation of z-scores and their corresponding graphic representations provided information on nutritional status by sex and age group. The discussion of results was made by comparing them to those of the reference population data from the NCHS.

To assess impact, the different results obtained were compared to the results of the basic anthropometric survey of the Ouémé carried out in 1997. Moreover, comparisons were made between children who participated in the program and those who did not.

At the beginning of these analyses and in light of the results of the final evaluation of the development activities program (DAP 1996-2000) the sociological study and pilot nutritional

interventions in three PBC communities of the Ouémé Department, recommendations were made with the goal of improving CRS' intervention results in the Ouémé and Plateau Departments.

3.10 Statistical Test Used

The comparison of the prevalence of the three types of malnutrition was done between the 1997 results and those of 2000, then between the children's group which benefited from the program and those who did not participate, utilizing the Pearson X test, with a risk factor α of 5% and a power (1-B) of 80%.

Before describing the nutritional status indices of the children used in this study, it was necessary to present how the indices are interpreted in order to draw conclusions on the nutritional status of children. Following the recommendations of the World Health Organization (WHO), the estimation of nutritional status is done by comparing children from one given area to an international reference population. This international reference has been established by the National Center for Health Statistics (NCHS), the Centers for Disease Control and Prevention (CDC) and WHO beginning from studies conducted using American children younger than five years old and in good health. The most frequently used analysis compares the study population to reference population and tabulates the number of children who fall below -2 and -3 standard deviations of the mean of the reference population. Another way to present this information is to present the mean z-score for the reference population. Z-score is simply the standard deviation of each child in relation to the mean of the reference population. Within the population, other types of comparisons² exist but are not presented here.

Among the indices used to describe the nutritional status of children, there are three that are based on the anthropometric methods (measurement of child's weight and height): height for age, weight for height, and weight for age. Each index has its own use and interpretation that will be briefly presented here.

The height for age is an index of chronic malnutrition and a lack of growth. The index height for age does not vary much according to seasons since a child cannot "lose" height. This index measures the long term effects of inadequate nutrition or chronic, repeated illnesses. Children whose height for age falls below negative two standard deviation exhibit slow growth and those with a height for age under negative three standard deviation exhibit severe growth problems. It is worth noting that after the age of two, height for age varies little.

The index of weight for height reflects the actual nutritional situation of the child, and, therefore, could vary greatly from one season to the next if, for example, there are certain seasonal nutritional deficiencies or if the child has recently been ill. A child who does not weigh enough for his height suffers from emaciation or is too thin. A child whose weight for height is below negative two standard deviation suffers from emaciation. And, the child whose weight for height is under negative three standard deviation is severely emaciated.

² Such as the median percentage and the percentiles, for example.

The index weight for age is a combination of the two indices already presented above. For example, it is difficult to distinguish if a child is in this situation because his height is too short for his age or because his weight is too low for his height. In any case, this index is highly recommended since it is often used in growth monitoring programs to assist mothers in following the growth of their children. A child whose weight for age is below negative two standard deviations of the mean for the reference population is underweight and a child whose weight for age is below negative three standard deviations of the reference population's mean is severely underweight.

4 . RESULTS

At the end of the survey, a total 620 children had been surveyed. During the tabulation, one questionnaire was eliminated because the child was not within the survey's age range (37 months). The definitive sample size is 629 children ages 18 to 36 months.

Of the final 629 children surveyed, 310 (49.3%) were boys and 319 (50.7%) were girls.

The survey took place from July 24 to July 26, 2000. 228 questionnaires were completed on the 24th, 235 on the 25th, and 166 on the 26th.

The average age of the children surveyed was 26.56 months \pm 4.9 standard deviations. As table 1 on page 29 illustrates, of the 629 children surveyed, 34.2% are within the 18 to 24 month age range, 36.4% in the 24 to 30 month age range, and 29.4% in the 30 to 36 month age group.

Of the 629 children surveyed, the exact birth date was verified using a card or birth book for 274 children (43.6%), according to birth certificates for 26 children (4.1%), using individual growth monitoring cards for 239 children (38.0%) and other documents for 24 children (3.8%). The ages of 66 children (44.4%) were determined with an age estimation table. In certain cases in which the age was estimated, it was possible to have the exact birth date of the child by referring to the documents of other children born in the same community.

Height was taken on 214 children in a recumbent position (34.2%) and on 412 children in a standing position. The number of children whose height was measured in the standing position is inferior to the number of children less than 24 months of age measured in a recumbent position, which was 215.

In other words, the number of children for which height was taken in the standing position is 412, whereas the number of children in the 24 to 36 month age range is 414. This is explained by the fact that on one hand one girl of 27 months was measured in the recumbent position, and therefore, her height was not taken into account; on the other hand, a 24-month-old boy and a 23-month-old girl who refused to be measured. Consequently, in the assessment of the results the number of children whose height or length were taken into account was 626.

The height for the 309 boys varied from 69.9 cm to 96.0 cm with an average of 82.6 cm and a standard deviation of 4.2. For the 317 girls, height varies from 68.2 cm to 91.3 cm with an average of 81.4 cm and standard deviation of 4.2. For the both sexes, the average height was 81.9 cm with a standard deviation of 4.3.

The weight for the 310 boys varied from 5.9 kg to 16.2 kg with an average of 10.7 kg and a standard deviation of 1.7. For the 319 girls, weight varies from 6.4 kg. to 14.1 kg. with an average of 10.4 kg and standard deviation of 1.5. For the 626 surveyed, the average weight was 10.7 kg. with a standard deviation of 1.5.

During the survey, all 629 children surveyed were naked or wore light clothes and none wore heavy clothing, and three girls wore braids, which have a minimal interference with height measurement. Three children wore beads of a negligible weight around their hips or wrists.

The 627 questionnaires were completely filled out. Two were left incomplete because of the two children who refused to be measured.

As far as the comments section of the questionnaire is concerned, 79.2% of the questionnaires contained no comments, 14% included comments that were not important to the analysis and frequently in relation to the child's behavior during the measuring (such as "child nervous," "child very agitated," "child cried," or "child very calm"), and additional information about age estimation (such as "child's age estimated using a health book or in relation to another known, verified birth," "in relation to local festivals or political events," or "in relation to the dates for deceased family members"), the number of times that measurements were retaken when the observed results seemed too low, any adornments the child wore, on the taking of measurements and deformities observed on the children in the lower extremities (varum knee).

For 6.3% of the questionnaires, comments were very important and concerned children's retarded development of motor skills, and presence of clinical signs of severe malnutrition: One child illustrated signs of kwashiorkor, 22 were noticeably underweight, one of whom was anemic, 12 twins were recorded, two of whom had bowed legs and two others who were seriously malnourished; one 29-month-old boy still was unable to walk; one child demonstrated mongolism.

Other comments provided additional information that helped explain the nutritional status of the child: two children were orphaned from their mothers. Nine children were ill at the time of the survey and two were convalescent.

Four comments reported that children were wearing beads, whose weight were deemed negligible. 11 comments concerned the children's health status at the time of the survey: 1 case of diarrhea was reported.

Of the 629 children surveyed, 193 (30.7%) had not participated in the program. For the 436 children who had, the minimum length of participation was one month and the maximum 32 months; the average length of participation was 19.1 +/- 4.9 months; the mean was 20 months and the mode was 24 months.

The children who had not participated in the program had an average height of 81.9 +-4.4 cm and an average weight of 10.7 +- 1.5 kg. The average height of children having participated in the program was 82.0 +- 4.2 cm; their average weight was 10.7 +- 1.5 kg.

Tables 1 to 10 below present the prevalence of children presenting moderate and severe stunting, who are underweight, and who suffer from wasting as revealed by the survey by sex and by age group (18 to 23.9 months, 24 to 29.9 months, and 30 to 35.9 months). These prevalences were calculated using z-scores for the indices--height for age, weight for age, and weight for height. The final tables present the mean z-scores for each index by sex and age group.

TABLE 1 :Children Measured According to Age Group and Sex

Age Group (in months)	Boys	Girls	Both Sexes
18 to 23.9	108	107	215 (34.2%)
24 to 29.9	114	115	229 (36.4%)
30 to 36	87	95	182 (29.4%)
18 to 36	310 (49.3%)	319 (50.7%)	629 (100%)

TABLE 2 : Stunting (height for age) by Age Group and Sex

Percent below -2.00 SDs

Age Group (in months)	Boys n = 309	Girls n = 317	Both Sexes n = 626
18 to 23.9 (215)	31.5% (34)	37.4% (40)	34.4% (74)
24 to 29.9 (229)	29.8% (34)	23.5% (27)	26.6% (61)
30 to 36 (182)	43.7% (38)	50.5% (48)	47.3% (86)
18 to 36 (626)	34.3% (106)	36.3% (115)	35.3% (221)

TABLE 3 : Children Who are Underweight (weight for age) By Age Group and by Sex

Percent below -2.00 Sds

Age Group (in months)	Boys n =310	Girls n = 319	Both Sexes n = 629
18 to 23.9 (215)	30.6% (33)	36.4% (39)	33.5% (72)
24 to 29.9 (229)	27.0% (31)	18.8% (22)	22.8% (53)
30 to 36 (182)	27.6% (24)	36.8% (35)	32.4% (59)
18 to 36 (626)	28.4% (88)	30.1% (96)	29.3% (184)

TABLE 4 : Wasting (weight for age) by Age Group and Sex
Percent below -2.00 SDs

Age Group (in months)	Boys n =310	Girls n = 319	Both Sexes n = 629
18 to 23.9 (215)	13.0% (14)	12.1% (13)	12.6% (27)
24 to 29.9 (229)	0.9% (1)	1.7% (2)	1.3% (3)
30 to 36 (182)	2.3% (2)	4.2% (4)	3.3% (6)
18 to 36 (626)	5.5% (17)	6.0% (19)	5.8% (36)

TABLE 5 : Severe Stunting (height for age) by Age Group and Sex
Percent below -3.00 SDs

Age Group (in months)	Boys n =309	Girls n = 317	Both Sexes n = 626
18 to 23.9 (215)	13.0% (14)	7.5% (8)	10.2% (22)
24 to 29.9 (229)	6.1% (7)	2.6% (3)	4.4% (10)
30 to 36 (182)	12.6% (11)	16.8% (16)	14.8% (27)
18 to 36 (626)	10.4% (32)	8.5% (27)	9.4% (59)

TABLE 6 : Children Who are Severely Underweight (weight for age) by Age Group and Sex
Percent below -3.00 SDs

Age Group (in months)	Boys n =310	Girls n = 319	Both Sexes n = 629
18 to 23.9 (215)	8.3% (9)	7.5% (8)	7.9% (17)
24 to 29.9 (229)	4.3% (5)	2.6% (3)	3.4% (8)
30 to 36 (182)	5.7% (5)	9.5% (9)	7.7% (14)
18 to 36 (626)	6.1% (19)	6.3% (20)	6.2% (39)

TABLE 7 : Severe Wasting (weight for height) by Age Group and Sex
Percent below -3.00 SDs

Age Group (in months)	Boys n =309	Girls n = 317	Both Sexes n = 629
18 to 23.9 (215)	3.7% (4)	0.9% (1)	2.3% (5)
24 to 29.9 (229)	0.0% (0)	0.9% (1)	0.4% (1)
30 to 36 (182)	0.0% (0)	0.0% (0)	0.0% (0)
18 to 36 (626)	1.3% (4)	0.6% (2)	1.0% (6)

TABLE 8 : Mean Z-score (height for age) by Age Group and Sex

Age Group (in months)	Boys n =309	Girls n = 317	Both Sexes n = 626
18 to 23.9 (215)	-1.66 ± 1.06	-1.65 ± 0.96	-1.66 ± 1.04
24 to 29.9 (229)	-1.49 ± 0.96	-1.49 ± 0.88	-1.49 ± 0.90
30 to 36 (182)	-1.82 ± 1.01	-2.08 ± 1.10	-1.96 ± 1.07
18 to 36 (626)	-1.64 ± 1.01	-1.72 ± 1.00	-1.68 ± 1.02

TABLE 9 : Mean Z-score (weight for age) by Age Group and Sex

Age Group (in months)	Boys n =310	Girls n = 319	Both Sexes n = 629
18 to 23.9 (215)	-1.57 ± 1.05	-1.56 ± 1.01	-1.56 ± 1.05
24 to 29.9 (229)	-1.46 ± 0.91	-1.30 ± 0.86	-1.38 ± 0.85
30 to 36 (182)	-1.45 ± 0.99	-1.72 ± 1.00	-1.59 ± 1.00
18 to 36 (629)	-1.49 ± 0.99	-1.51 ± 0.97	-1.50 ± 0.97

TABLE 10 : Mean Z-score (height for age) by Age Group and Sex

Age Group (in months)	Boys n =309	Girls n = 317	Both Sexes n = 626
18 to 23.9 (215)	-0.94 ± 0.98	-0.93 ± 0.99	-0.94 ± 0.97
24 to 29.9 (229)	-0.55 ± 0.69	-0.43 ± 0.77	-0.49 ± 0.70
30 to 36 (182)	-0.46 ± 0.93	-0.53 ± 0.80	-0.49 ± 0.83
18 to 36 (626)	-0.66 ± 0.92	-0.63 ± 0.89	-0.64 ± 0.86

The tabulation of the anthropometric indices of the 629 children surveyed show that:

- ◆ 35.3% (CI at 95% = 31.6 to 39.2) of the children aged 18 to 36 months illustrate stunting and therefore suffer from a chronic malnutrition and among these children, 9.4% or 59 children are severely stunted,
- ◆ 29.3% (CI at 95% = 25.8 to 33.0) of the children surveyed are underweight, which is severe for 6.2% or 39 of the 629 children,
- ◆ 5.8% (CI at 95% = 4.1 to 7.9) or only 36 of the 626 children whose height was taken into account suffer from acute malnutrition or wasting; 1% present severe wasting,

- ◆ For the 629 children, the mean z-scores for height for age is $-1.68 + 1.02$ standard deviations; for weight for age, is $-1.50 + 0.97$ standard deviations, and for weight for height is $-0.64 + 0.86$ standard deviations.

The rates of the different types of malnutrition in children who have and have not benefited from the program are mentioned in Table 11 below. The different rates observed are lower in children who have not participated in the program, except for those who are underweight, all forms of which are mixed together.

Table 11: Rates of the different types of malnutrition according to the status of children surveyed in relation to the PBC.

Status of children	Rate of stunting		Rate of children who are underweight		Rate of wasting	
	All forms	Severe	All forms	Severe	All forms	Severe
Children who participated in the program (n=436)	36.5%	10.1%	28.6%	7.3%	5.0%	1.4%
Children who did not participate in the program (n=193)	32.6%	7.9%	30.5%	3.6%	5.3%	0%

Table 12 below shows the different types of malnutrition in terms of the length of exposure of the child to the program. It can be observed that for 20 children the length of exposure exceeded the 24 months required by the program.

The rates of children presenting stunting, who are underweight and who suffer from wasting tend to diminish with increased exposure up to 24 months; beyond that, the tendency is toward an increase.

Table 12: Rates of different types of malnutrition in terms of the length of program exposure among the 436 children participating.

Rates of malnutrition						
Length of program exposure	Stunting		Children who are Underweight		Wasting	
	All forms*	Severe	All forms	Severe	All forms	Severe
1-12 months n = 52	42.3%	9.6%	36.5%	9.6%	5.8%	0%
13-18 months n= 108	39.8%	11.1%	36.1%	12.0%	10.2%	1.9%
19-24 months n = 256	32.8%	8.6%	23.0%	5.1%	4.3%	1.6%
25-36 months n = 20	50.0%	25.0%	40.0%	5.0%	5.0%	0%

* All forms = moderate + severe.

4.2 Impact of the Program on the Nutritional Status of Children in the Communities Served

4.2.1 Comparison with 1997 results

The basic survey carried out from October 27-31, 1997 in the former Ouémé Department revealed that children ages 18 to 36 months presented prevalences of:

- ◆ 40.8% for growth stunting,
- ◆ 30.8% for children who are underweight,
- ◆ 4.4% for wasting.

The prevalence of severe forms of these three types of malnutrition were:

- ◆ 11.6% for growth stunting,
- ◆ 4.7% for children who are underweight,
- ◆ 0.2% for severe wasting.

Tables 13 to 18 below compare the prevalence of the different types of malnutrition in 1997 with that of 2000 in children aged 18 to 36 months. They also show the meaning and degree of significance of the differences observed in 1997 and 2000 rates by age group.

TABLE 13 : Synoptic table of stunting rates by age group according the 1997 and 2000 surveys.

Age group	Year				Statistical Significance	
	1997		2000			
	Group size	Rate (n)	Group size	Rate (n)	p	Significance
18 to 23,9 months	230	36,5% (84)	215	34,4% (74)	0,64	IS
24 to 29,9 months	192	42,7% (82)	229	26,6% (61)	0,005	S**
30 to 36 months	189	43,9% (83)	182	47,3% (86)	0,61	IS
18 to 36 months	611	40,8% (249)	626	35,3% (221)	0,048	S*

* = Degree of significance S = Significant IS = Insignificant

TABLE 14 : Synoptic table of rates of children who are underweight by age group according the 1997 and 2000 surveys.

Age group	Year				Statistical Significance	
	1997		2000			
	Group size	Rate (n)	Group size	Rate (n)	p	Significance
18 to 23,9 months	230	30,0% (69)	216	33,5% (72)	0,43	NS
24 to 29,9 months	192	31,3% (60)	231	22,8% (53)	0,06	NS
30 to 36 months	189	30,7% (58)	182	32,4% (59)	0,72	NS
18 to 36 months	611	30,6% (187)	629	29,3% (184)	0,64	NS

TABLE 15 : **Synoptic table of rates of wasting by age group according the 1997 and 2000 surveys.**

Age group	Year				Statistical Significance	
	1997		2000			
	Group size	Rate (n)	Group size	Rate (n)	p	Significance
18 to 23,9 months	230	7,0% (16)	215	12,6% (27)	0,047	S*
24 to 29,9 months	192	2,6% (5)	229	1,3% (3)	0,26	NS
30 to 36 months	189	3,2% (6)	182	3,3% (6)	0,94	NS
18 to 36 months	611	4,4% (27)	626	5,8% (36)	0,28	NS

TABLE 16 : **Synoptic table of rates of severe stunting by age group according the 1997 and 2000 surveys.**

Age group	Year				Statistical Significance	
	1997		2000			
	Group size	Rate (n)	Group size	Rate (n)	p	Significance
18 to 23,9 months	230	7,8% (18)	215	10,2% (22)	0,38	NS
24 to 29,9 months	192	8,9% (17)	229	4,4% (10)	0,06	NS
30 to 36 months	189	19,0% (36)	182	14,8% (27)	0,28	NS
18 to 36 months	611	11,6% (71)	626	9,4% (59)	0,21	NS

TABLE 17 : Synoptic table of rates of children who are severely underweight by age group according the 1997 and 2000 surveys.

Age group	Year				Statistical Significance	
	1997		2000			
	Group size	Rate (n)	Group size	Rate (n)	p	Significance
18 to 23,9 months	230	2,6% (6)	216	7,9% (17)	0,01	S**
24 to 29,9 months	192	4,7% (9)	231	3,4% (8)	0,52	NS
30 to 36 months	189	7,4% (14)	182	7,7% (14)	0,92	NS
18 to 36 months	611	4,7% (29)	629	6,2% (39)	0,26	NS

TABLE 18 : Synoptic table of rates of severe wasting by age group according the 1997 and 2000 surveys.

Age group	Year				Statistical Significance	
	1997		2000			
	Group size	Rate (n)	Group size	Rate (n)	p	Significance
18 to 23,9 months	230	0% (0)	215	2,3% (5)	0,02	S*
24 to 29,9 months	192	0,5% (1)	229	0,4% (1)	0,7	NS
30 to 36 months	189	0% (0)	182	0% (0)	-	-
18 to 36 months	611	0,2% (4)	626	1% (6)	0,07	NS

4.2.1.1. Impact on stunting

As Table 13 on Page 38 shows, a difference of 5.5% observed between the prevalence of stunting in 1997 (40.8%) and that of 2000 (35.3%) is statistically significant ($p=0.048$). On the

other hand, there is no significant difference between the prevalence of severe stunting in 1997 (11.6%) and that of 2000 (9.4%) ($p=0.21$), as table 16 shows.

The comparison of stunting rates by age group shows a lower rate in children aged 24 to 30 months in 2000 (26.6%) than in 1997 (42.7%) and this difference is quite significant from a statistical point of view ($p=0.005$). This suggests that from 1997 to 2000 one can see a reduction in the stunting rate of 16.1% in the 24 to 30 month age group.

4.2.1.2. Impact on children who are underweight

There appears to be no significant statistical difference between the prevalence of children who are underweight in 1997 (30.6%) and that of 2000 (29.3%) ($p=0.64$); it is the same situation for the severe form ($p=0.26$). The comparison by age group shows a rate of children who are severely underweight that is significantly higher in 2000 (7.9%) than in 1997 (2.6%) in children aged 18 to 24 months ($p=0.01$).

4.2.1.3. Impact on wasting

The difference observed between the prevalence of wasting in 1997 (4.4%) and that of 2000 (5.8%) is not statistically significant ($p = 0.28$). The 18 to 24 month age group has a significantly higher rate of severe wasting in 2000 (2.3%) than in 1997 (0%) ($p = 0.02$).

The comparison of wasting rates by age group shows in children aged 18 to 24 months a higher rate in 2000 (12.6%) than in 1997 (7.0%) and this difference is statistically significant ($p = 0.047$).

4.2.2. Impact of the length of program participation

Of the 629 children surveyed, 193 (30.7%) had not participated in the program. According to table 11 on page 33 and as we have shown on the same page, the rates of the different types of malnutrition tend to be lower in children who have not participated in the program except for children who are underweight, all forms lumped together.

However, no statistically significant difference can be observed in the distribution of malnutrition regardless of the degree of severity in the two groups of children as much as for stunting ($p = 0.57$) as for children who are underweight ($p = 0.08$) and wasting ($p = 0.27$).

Concerning the 436 children who had participated in the program, the comparison of the rates of the different types of malnutrition (see Table 12 page 34) as regards the length of exposure to the program does not show a statistically significant difference for stunting ($p = 0.57$), for children who are underweight ($p = 0.0501$) and wasting ($p = 0.33$).

However, in the 24 to 36 month age group, a statistically significant difference can be noted between the stunting rates of the group of children for whom the length of participation varies between 1 and 18 months (34.4%) and those for whom the length is between 19 and 36 months (13.5%) ($p = 0.002$).

In this age group, a significant difference is also observed between the rate of children who are underweight of the group of children for whom the length of participation is 1 to 18 months (34.4%) and those for whom the length of participating extends from between 19 and 36 months (21.2%) ($p = 0.004$).

According to table 12 on page 34, among the 20 children whose length of program participation exceeds the 24 months required, 50% suffer from stunting, 25% of which is severe; 40% are underweight, 5% of whom severely; 5% suffer from wasting, none of which is severe.

5. DISCUSSION

At the end of the description of the analysis of the results, our discussion will focus successively on:

- ◆ The attainment level of the objectives,
- ◆ The quality of the data collected,
- ◆ The results obtained.

5.1 Attainment level of the objectives

The survey's objective was to determine the distribution of anthropometric indices height for age, weight for age, and weight for height in a representative sample of children aged 18 to 36 months of age in 30 communities chosen randomly among the 78 used by CRS in the Ouémé and Plateau Departments in relation to CRS' intervention, then to measure the impact of this intervention.

The methodology used to identify children, the techniques for collection information and the type of information collected permitted the survey team to meet their stated objectives.

5.2 Quality of Data Collected

In order to guarantee the quality of data collected, care was taken in the following areas: the training of supervisors and surveyors, the sampling method, the supervision of data collection, and in the tabulation and analysis of the data.

The training of five days given to surveyors and supervisors on proper measuring techniques, including the reading and recording of measurements and a standardization test at the end of the training session followed by refresher sessions, gave the necessary skills and experience necessary to take anthropometric measurements with precision and accuracy.

During the survey, the supervision of surveyors was constant with a ratio of one supervisor per team of two surveyors. The data were also verified as they were collected. Nevertheless, given that the children aged 18 to 36 months of age that constitute our target group

for the survey are often less cooperative and frequently agitated during the measuring, we can not presume that every error was eliminated.

5.3. Obtained Results

5.3.1 Differences of rates observed between 1997 and 2000 for the types of malnutrition studied

5.3.1.1. For stunting

The prevalence of malnutrition observed in this study at the level of the communities benefiting from the program is 35.3% for stunting; the prevalence obtained in 1997 was 40.8%, a reduction of 5.5%. This reduction is statistically significant ($p = 0.048$), but it should be noted that it is close to the threshold of significance held by the study ($\alpha = 0.05$).

An analysis by age group shows that only the 24 to 30 month age group showed a noticeable reduction of 16.1% in stunting, confirmed statistically ($p = 0.005$). In other age groups, the differences observed are not statistically significant.

The global effect of a 5.5% reduction in stunting obtained can be explained by the absence of effect in age groups other than the 24 to 30 month group where the rate of reduction is 16.1%.

Several hypotheses can justify this situation. Those that seem the most plausible to us are the following:

- ◆ The 18 to 24 month age group corresponds to the end of weaning which a period of high risk for children in developing countries. In effect, this period is characterized by a high prevalence of diarrhea and infectious and parasitical diseases, linked to the immaturity of the child's immune system at that age. Yet the community based MCH program does not take a health care category into account. Furthermore, a study conducted in three communities of the Ouémé in 1999 by J-P. Bouleyo reveals that food awarded by the community based FNP does not go directly to the target population. They are either consumed by all the members of the family, or sold, which could lessen the effect of the program on the nutritional status of children.
- ◆ The enthusiasm of those implementing the program has lost its edge, which has an impact on the quality of the services rendered. This has materialized through the lack of the program's effect in the youngest children (those less than 24 months old.)
- ◆ The lack of effect on children aged 30 to 36 months can be explained by the fact that these children, after having left the program at the end of 24 prescribed months, no longer benefit from adequate nutritional contributions.

5.3.1.2. For children who are underweight and suffer from wasting

There was no apparent statistically significant difference between the rates of children who are underweight ($p = 0.26$) and wasting ($p = 0.28$) at the sample group level. A possible explanation to this observation is that this study was lead at the end of July 2000, a time corresponding to the height of the dry period of the Ouémé and Plateau Departments, while the 1997 survey was lead in October during a period of good food availability. It is known that being underweight and wasting are very sensitive to fluctuations in food availability.

The analysis of the results revealed frequencies of children who were severely underweight and showed wasting that were significantly higher in 2000 than in 1997 in the 18 to 24 month age group. These differences can also be explained by the poorer food availability in July than in October, but also by the particular vulnerability of the 18 to 24 month age group mentioned above.

5.3.2. Rates of malnutrition observed regarding to adherence or non-adherence to the program

No significant difference from a statistical point of view was observed concerning the distribution of the three types of malnutrition (regardless of the degree of severity) between the group of children benefiting from the program and those who did not.

A possible hypothesis to explain this situation is that the mothers who participate in the program would usually be those with the least amount of resources, and the benefits of the program would have filled in the gap that would normally have separated them from the women of the community with the best resources. This hypothesis suggests that, were it not for the program, the rates of malnutrition would be much higher in this same group of children.

It would be interesting to initiate a comparative study of the socio-economic profile of mothers who participate in the program with that of women who do not take part, in order confirm or disconfirm this hypothesis.

5.3.3. Rates of malnutrition observed in terms of the length of exposure to the program

It became apparent that the length of exposure to the program had a beneficial effect in the 24 to 36 month age group and that this effect begins to be felt beginning from 18 months of exposure.

It may seem as if from birth to age 18 months the program has no effect on the nutritional status of the children. Actually, before 18 months and more specifically from 6 to 18 months, the risks linked to weaning and the immaturity of the immune system, which frequently exposes the child to infectious disease, inhibit the health effects of the program. And when the children do make it to this level, the beneficial effect of the program shows through.

6 . CONCLUSION AND RECOMMENDATIONS

6.1. Conclusion

CRS interventions in the Ouémé and Plateau Departments allowed us to observe in general the tendency toward reduction in the prevalence of different types of malnutrition in children aged 18 to 36 months, but these statistical analyses are not confirmed in the quasi-totality of the cases. Only the prevalence of stunting experienced a significant reduction, albeit weak (5.5%).

The age group that benefited in a significant way from the interventions is children aged 24 to 30 months in the area of stunting.

Factors such as weaning difficulties and the curtailment of participation in the program at 24 months seem to have a negative effect on the results in other age groups.

6.2. Recommendations

To finish this analysis of the results, we have made the following recommendations to improve the effectiveness of the program:

1. Study the possibility of integrating the community level management of childhood diseases with the PBC. To this purpose, it would be desirable that CRS develop a partnership with the Ministry of Public Health concerning the community component of the latter's Integrated Childhood Disease Management (ICDM);
2. Intensify through educational sessions the sensitization of mothers on the effective use of food for the targeted children;
3. Given the fact that deterioration of height-weight growth of children reappears in the 12 months following the exit from the program, it would be desirable to prolong the length of growth monitoring of the children until the age of 36 months or less;
4. Improve the content of the education of mothers in the area of weaning children, in order to make this education more effective. In addition to the quality of food, special attention should be focused on the number, quantity and diversity of meals;
5. Improve the quality of the management of malnourished children for, in certain cases, recovery comes only after the 24 recommended months of participation in the program;
6. Give particular attention to children aged 6 to 18 months in the course of executing the program's activities, insisting on the early management of diarrheal and infectious diseases as well as an improvement of the quality of weaning;
7. Carry out a study on the competence levels of community agents in the area of malnutrition case management, with the goal of identifying their deficiencies and correcting them;
8. Carry out a study comparing the socio-economic profiles of the mothers who participate in the program with those who do not in order to better assess the program's effectiveness. In effect, if it reveals that it is the poorest who are participating in the program, the absence of statistically significant differences obtained at the level of different types of malnutrition between the group benefiting from the program and those who are not would be due to the beneficial effects of the program on the poorest through the suppression of the gap which

would certainly exist between the two groups;

9. In order to make the data from the effect evaluation survey more comparable to those of the basic survey, it is desirable to carry out two surveys at the same time of year.